

**CLAIMS**

What is claimed is:

1. A method of fabricating a vertically integrated circuit, the method comprising the steps of:

    providing a bulk substrate, said bulk substrate including a buried oxide layer;  
    selectively creating strong bond regions and weak bond regions on said substrate;  
    providing a first bonded semiconductor layer vertically supported on said substrate;  
    creating semiconductor device portions on said first bonded semiconductor layer, said semiconductor device portions corresponding to said weak bond regions;  
    removing said first semiconductor layer from said bulk substrate; and  
    bonding said first semiconductor layer to a second semiconductor layer.

2. The method of claim 1, wherein said buried oxide layer is formed by ion implantation.

3. The method of claim 2, wherein said buried oxide layer is formed by oxygen implantation.

4. A method of fabricating a vertically integrated circuit, the method comprising the steps of:

    providing a bulk substrate;  
    selectively creating strong bond regions and weak bond regions on said substrate;  
    providing a first bonded semiconductor layer vertically supported on said substrate;

creating semiconductor device portions on said first bonded semiconductor layer, said semiconductor device portions corresponding to said weak bond regions;

forming a buried oxide layer at the interface between said first semiconductor layer and said bulk substrate;

removing said first semiconductor layer from said bulk substrate; and

bonding said first semiconductor layer to a second semiconductor layer.

5. The method of claim 4, wherein said buried oxide layer is formed by ion implantation.
6. A method of fabricating a vertical microelectromechanical device, the method comprising the steps of:
  - providing a bulk substrate, said bulk substrate including a buried oxide layer;
  - selectively creating strong bond regions and weak bond regions on said substrate;
  - providing a first bonded semiconductor layer vertically supported on said substrate;
  - creating an electrode on said first bonded semiconductor layer, said electrodes corresponding to said weak bond regions;
  - creating an actuatable element disposed opposite said electrode;
  - removing said first semiconductor layer from said bulk substrate; and
  - bonding said first semiconductor layer to a second semiconductor layer.
7. The method of claim 6, wherein said buried oxide layer is formed by ion implantation.

8. A method of fabricating a vertical microelectromechanical device, the method comprising the steps of:

providing a bulk substrate, said bulk substrate including a buried oxide layer;  
selectively creating strong bond regions and weak bond regions on said substrate;  
providing a first bonded semiconductor layer vertically supported on said substrate;  
creating an electrode on said first bonded semiconductor layer, said electrodes corresponding to said weak bond regions;  
creating an actuatable element disposed opposite said electrode;  
forming a buried oxide layer at the interface between said first semiconductor layer and said bulk substrate;  
removing said first semiconductor layer from said bulk substrate; and  
bonding said first semiconductor layer to a second semiconductor layer.

9. The method of claim 8 wherein said buried oxide layer is formed by ion implantation.

10. A method of fabricating a multi layer microfluidic device, the method comprising the steps of:

providing a bulk substrate, said bulk substrate including a buried oxide layer;  
selectively creating strong bond regions and weak bond regions on said substrate;  
providing a first bonded layer vertically supported on said substrate;  
creating a port on said first bonded layer, said port corresponding to said weak bond regions;  
creating a channel mechanically coupled to said port;

removing said first layer from said bulk substrate; and  
bonding said first layer to a second layer.

11. The method of claim 10, wherein said bulk oxide layer is formed by ion implantation.

12. A method of fabricating a multi layer microfluidic device, the method comprising the steps of:

providing a bulk substrate;  
selectively creating strong bond regions and weak bond regions on said substrate;  
providing a first bonded layer vertically supported on said substrate;  
forming a buried oxide layer at the interface between said first bonded layer and said bulk substrate;  
creating a port on said first bonded layer, said port corresponding to said weak bond regions;  
creating a channel mechanically coupled to said port;  
removing said first layer from said bulk substrate; and  
bonding said first layer to a second layer.

13. The method of claim 12, wherein said bulk oxide layer is formed by ion implantation.